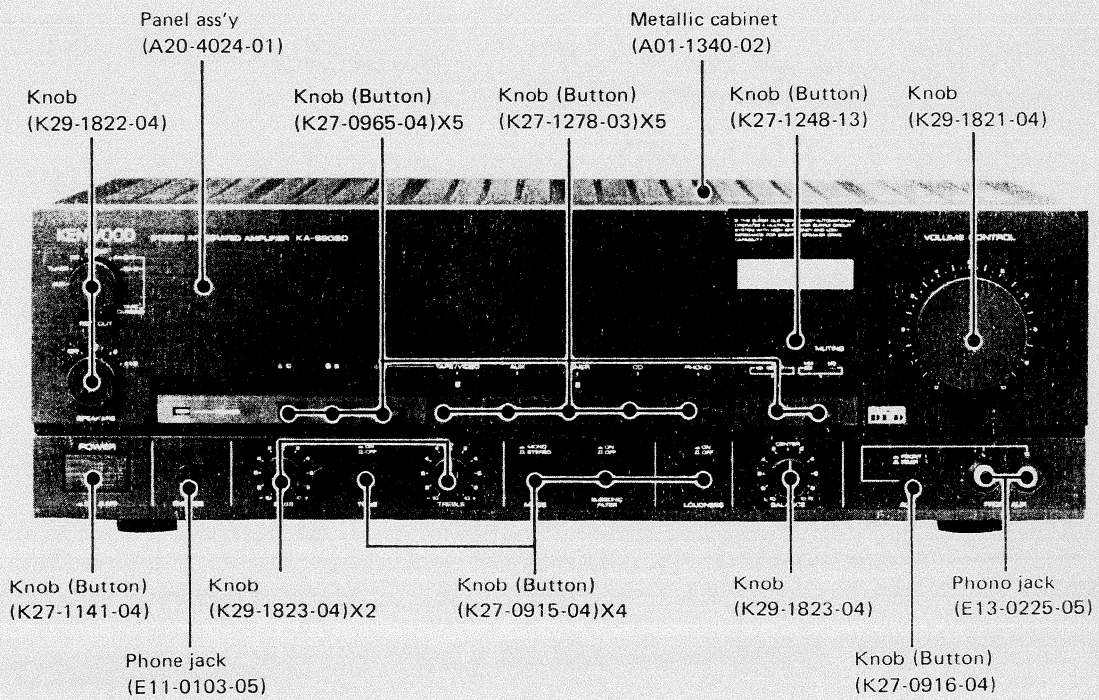
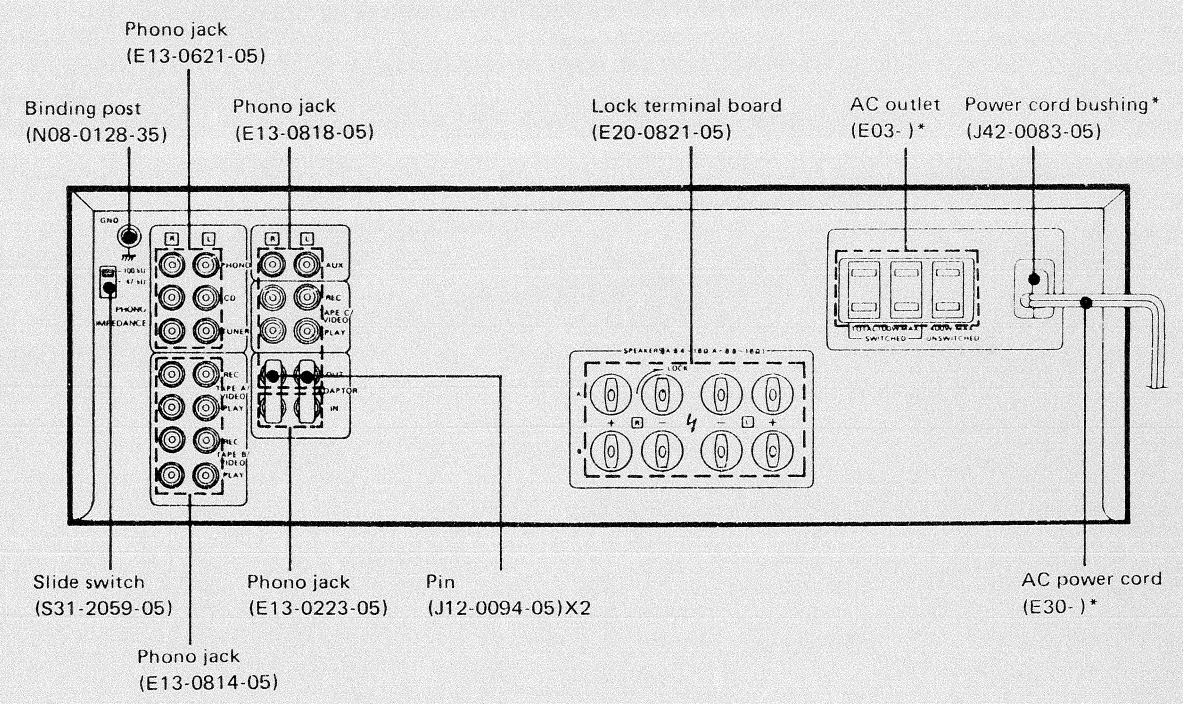
SERVICE MANUAL

KENWOOD **KA-990SD**

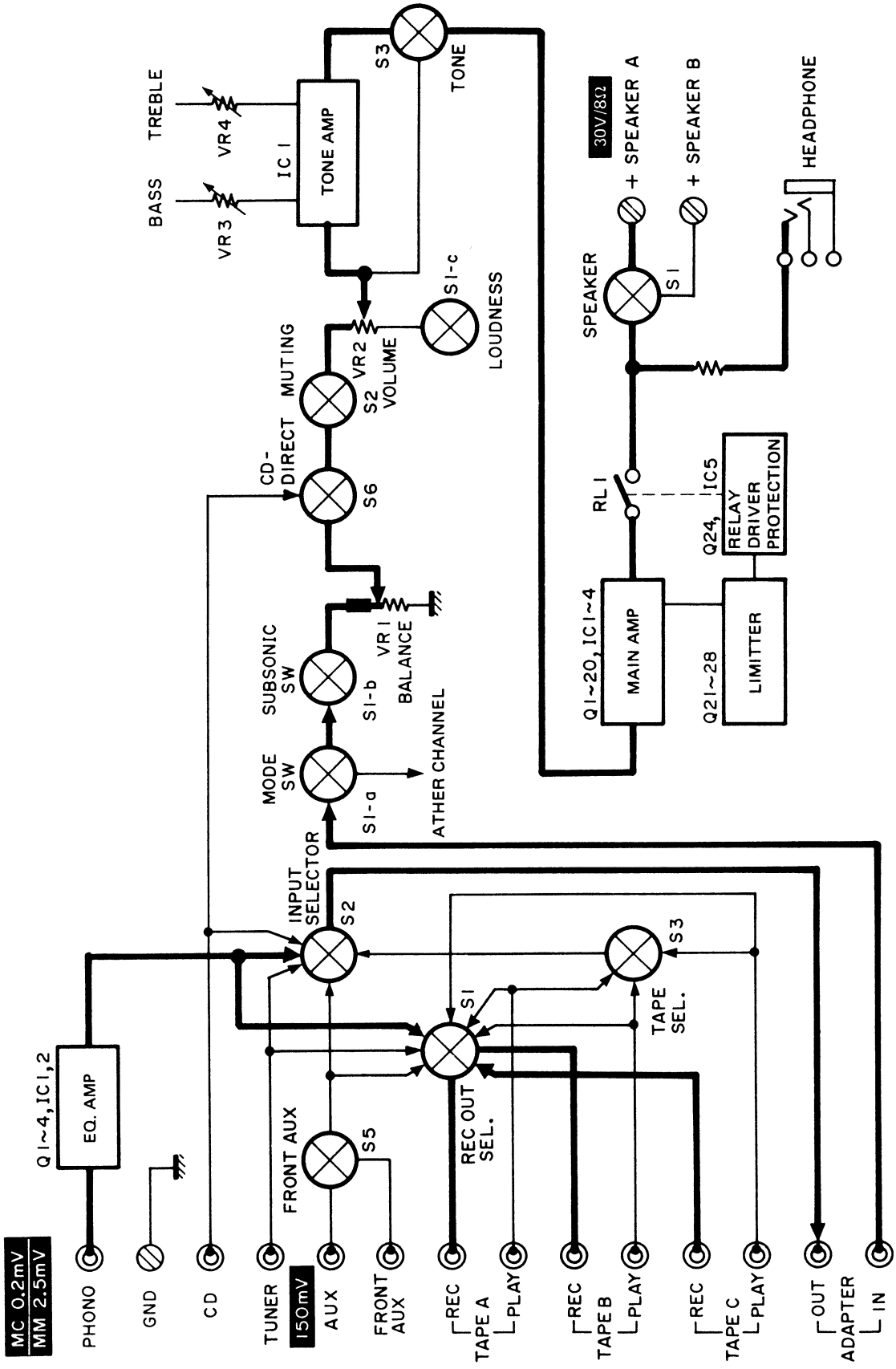
STEREO INTEGRATED AMPLIFIER





* Refer to Parts List on page 12.

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

(X08-2170-11) : PRE AMPLIFIER

Element	Use and Function	Operation and Rating
Q1~4	Differential amp	Input differential amplifier
Q5~8	AVR	
Q9,10	Power supply muting	Muting circuit when the power is turned off.
Q11,12	Astable Multi-vibrator	Power LED blinking circuit when the power is turned on.
Q13	For constant current supply	Determines the current supplied to the input differential amp together with D1,2 and R18,46.

(X07-2000-11) : POWER AMPLIFIER

Element	Use and Function	Operation and Rating
Q1~4	Cascade	
Q5,6	1st stage differential amp	
Q7	For constant current supply	
Q9,10	For constant current supply	Constant current transistors for the 1st stage differential amplifier.
Q11,12	2nd stage differential amplifier	
Q13	For constant current supply	
Q15,16	Current mirror	
Q17~20	3rd stage differential amplifier	Class A amplifier.
Q21~28	Current protection	Q27 and 28 are high tension transistors.
Q29	Protection driver	Detects the over load to drive the protection IC5.
IC1 (1/2)	Bias, Pre-driver	
IC2 (1/2)	Bias, Pre-driver	
IC3,4	High/Low power selector IC	Switching IC for high and low output signal transistor.
IC1 (2/2)	Final IC	Q8,9 (IC1 2/2) are turned on while the high output.
IC2 (2/2)	Final IC	Q6,7 (IC2 2/2) are turned on while the low output.
IC5	Protection relay driver	Controlled by Q29 to turned on when muting relay RL1 is activated.

(X11-1852-72) : CONTROL

Element	Use and Function	Operation and Rating
Q1	Muting lamp driver	
IC1	Tone amp	

CIRCUIT DESCRIPTION

DESCRIPTION OF SUPER DLD CIRCUIT

With the former DLD amp which has high efficiency, the heatsink can be small, compared with class B amplifier which has the same output power, resulting in high cost performance.

However, the normal listening output power is several mW to several hundred mW and the high voltage circuit seldom operates. For example, with the circuit shown in Fig. 1, the high and low setting is 30W/8Ω to obtain maximum output power of 100W/8Ω. Therefore, at low power of 0~30W, low voltage circuit consisting of Q6, Q7, D18~20,9,11,C63 and C64 functions and high voltage circuit consisting of D22, C61 and C62 operates rarely.

When the high voltage circuit operates, the low voltage circuit does not operate.

With the super DLD circuit, the circuit which is not operates is effectively used to improve performance and tone quality. The operation of the super DLD is described below.

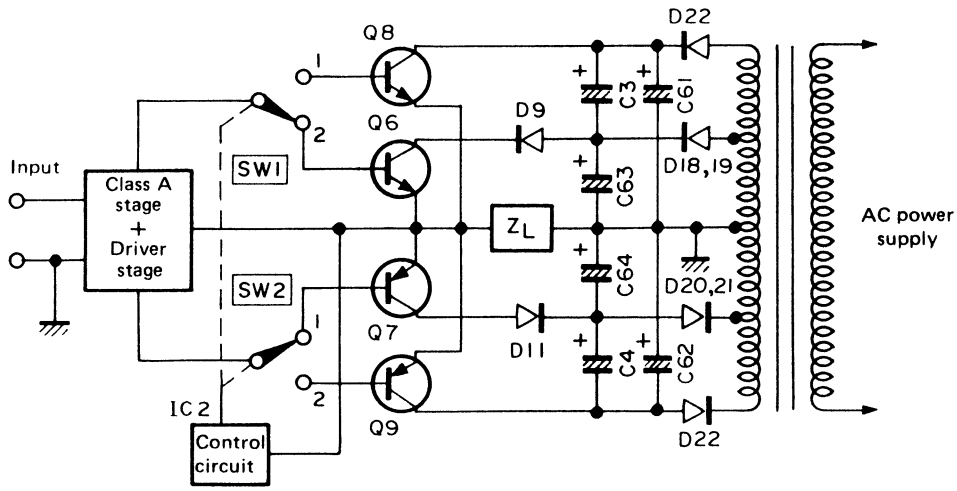


Fig. 1

OPERATIONAL DESCRIPTION

As shown in Fig. 1, C3 and C4 are added to the former DLD circuit to form super DLD circuit. Hereafter, the operation of the amplifier is calss B and the description applies to positive side half cycle.

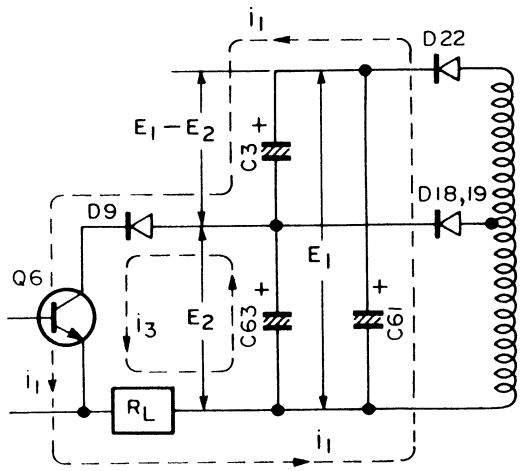


Fig. 2–1

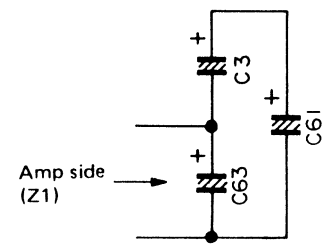


Fig. 2–2

CIRCUIT DESCRIPTION

1. Low power operation

When Q8 opens, the circuit in Fig. 1 can be seen as an equivalent circuit shown in Fig. 2–1.

- At non-signal condition, C3, C63 and C61 are fully charged and voltages E1, E2 and E1–E2 are supplied to C61, C63 and C3 respectively.
- When the signal is applied and Q6 turns on, C63 supplied current i_3 to RL via D9 and Q6 and C61 supplies current i_1 to RL via C3, D9 and Q6. Namely, C3 functions as an i_1 bias circuit.
- When this operation is viewed from the amp, the circuit can be described as shown in Fig. 2–2. Namely, the power impedance Z1 viewed from the amp is as follows.

$$Z_1(j\omega) = \frac{1}{j\omega} \cdot \frac{C3 + C61}{C3 \cdot C61 + C63(C3 + C61)}$$

Assuming that C3 = C63 = C61,

$$Z_1(j\omega) = \frac{1}{j\omega} \cdot \frac{1}{\frac{3}{2}C63}$$

Therefore, the curcuit is the same as the former circuit in which C3 and C4 are not employed and C63 is increased by 3/2. The power impedance is decreased by 2/3, to 33%.

Therefore, the AC component at collector voltage of Q33 is decreased, resulting in improved performance and sound quality.

2. High power operation

When Q6 opens, the circuit in Fig. 1 can be seen as an equivalent circuit shown in Fig. 3–1.

- When the signal is supplied and Q8 turns on, the series circuit consisting of C3 and C63 supplies i_3 to RL via Q8 and C61 supplies i_1 to RL via Q8.
- When this operation is viewed from amp, the circuuit can be described as shown in Fig. 3–2. Namely, the power impedance Z2 viewed form the amp is as folows.

$$Z_2(j\omega) = \frac{1}{j\omega} \cdot \frac{C3 + C63}{C3 \cdot C63 + C61(C3 + C63)}$$

Assuming that C3 = C63 = C61,

$$Z_2(j\omega) = \frac{1}{j\omega} \cdot \frac{1}{\frac{3}{2}C61}$$

Therefore, the circuit is the same as the former circuit in which C3 and C4 are not employed and C63 is increased by 3/2. The power impedance is decreased by 2/3, to 33%. Therefore, the AC component at collector voltage of Q8 is decreased, resulting in improved performance and sound quality.

This operation can be applied to the negative side half cycle.

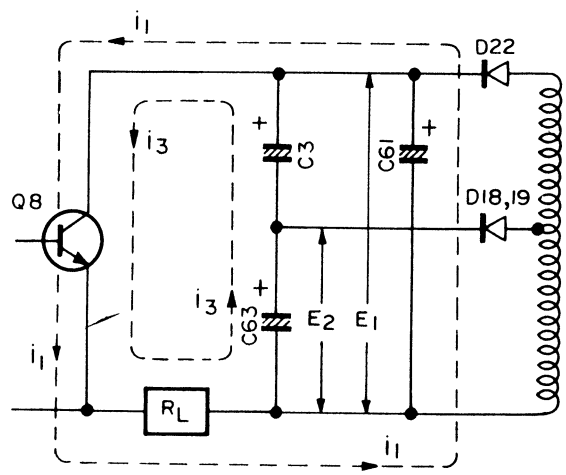


Fig. 3–1

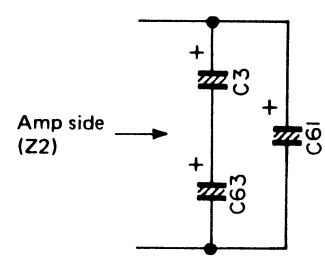
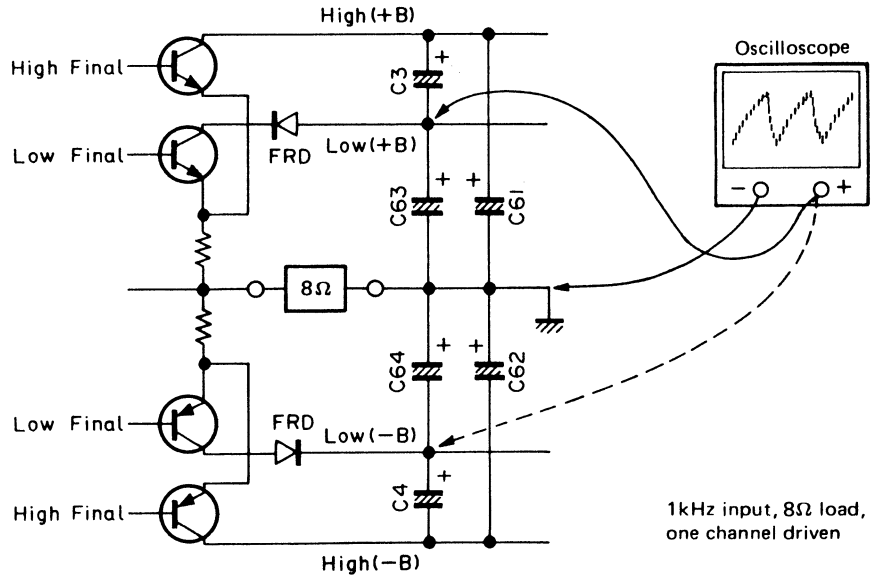


Fig. 3–2

CIRCUIT DESCRIPTION

CHECKING METHOD OF SUPER DLD CIRCUIT OPERATION

1. Connect an oscilloscope to LOW (+B) and GND.
   Set the oscilloscope input coupling mode to AC.



2. Continuously change the output voltage and monitor the ripple waveform at high and low switching.

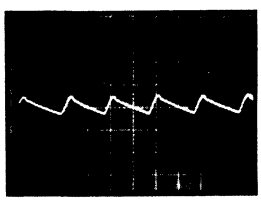


Photo 1
Volume : 0

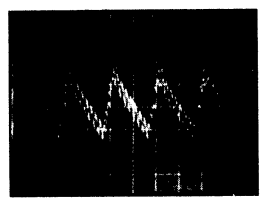


Photo 2
Just before switching

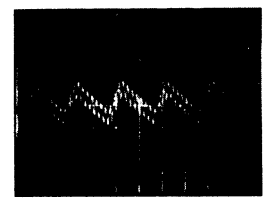


Photo 3
Just after switching

3. Connect the oscilloscope to HIGH (−B) and GND.
   Set the oscilloscope input coupling mode to AC.

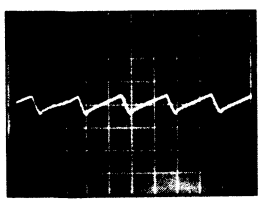


Photo 4
Volume : 0

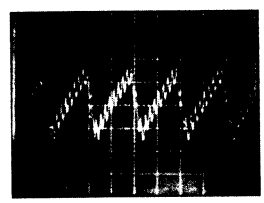


Photo 5
Just before switching

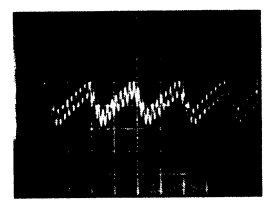


Photo 6
Just after switching

4. Check on the opposite channel's LOW (+B) and HIGH (−B) line in the same way.

CIRCUIT DESCRIPTION

CONSTANT-VOLTAGE POWER SUPPLY CIRCUIT

D4 : RD20J (B2)
A Zener diode (constant-voltage). This generates the reference voltage for this circuit. Even if the current flowing into D9 fluctuates, the voltage at point A is kept constant (Approximately 20.6V.)

C31 : 100μ, 25V
Used as the ripple filter and to prevent the noise generated by D9.

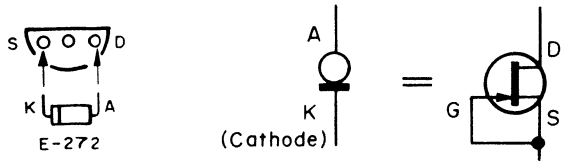
Q5 : 2SD313V-AL
A current amplifier. This is necessary when the load current is large or the capacity (Iz) of the Zener diode is small.

D17 : E-272
A constant-current element. This supply a constant current to the Zener diode to obtain a more constant voltage.

Constant-current characteristics: When the voltage between the gate and source of the FET is 0 (zero) and V_{DS} is between V_P~V_X, the drain current changes little.

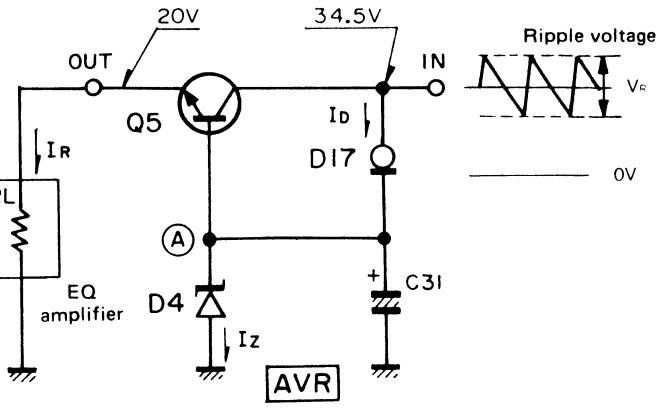
The gate and source of the FET are connected with a constant-current diode (E-272). The anode corresponds to the drain, and the cathode corresponds to the gate and source.

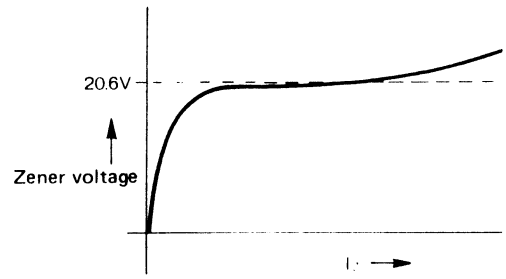
- Constant current diodes E-272 in some preamplifier unit are indicated by the symbols of FET on the silk of the printed circuit board. Insert each of them so that the drain will ben connected to the anode and the source to the cathode (See the following figure.)

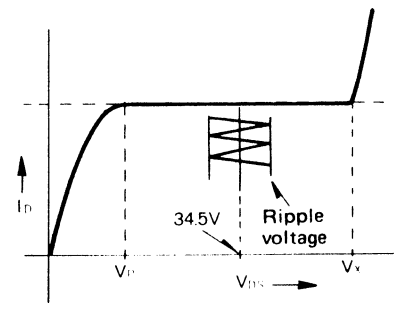


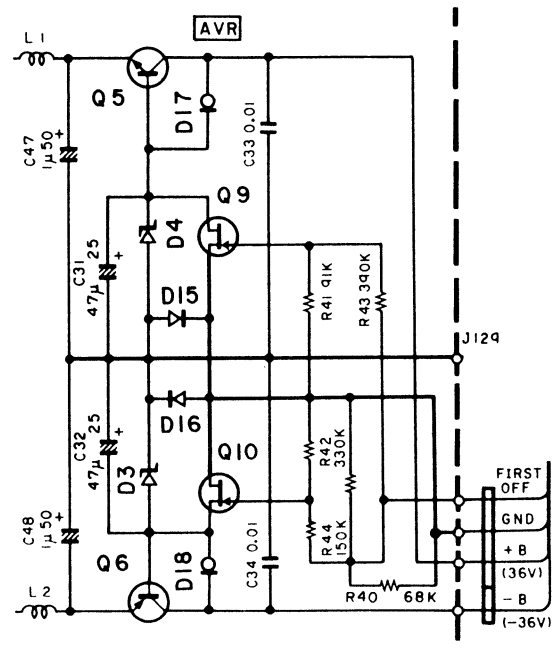
CIRCUIT FOR PREVENTING SHOCK NOISE GENERATED WHEN TURNING OFF THE POWER

The power supply section of the preamplifier contains the circuit which consists of Q9 (Q10) and prevents the shock noise generated when turning off the power from entering the output. While the power is turned on, since the voltage of −12V is continuously applied to the gate of Q9, Q9 is turned off and Q5 works as a normal AVR. At the same time the power is turned off, the gate of Q9 which −12V has been applied to and which has been turned off is turned on bacause of the discharge from C71 and 72, then the base voltage of Q5 is lowered and Q5 is cut off to turn off the power applied to the preamplifier. D15 in the source of Q9 is a diode which protect Q9 from the static electricity.









ADJUSTMENT/REGLAGE/ABGLEICH

ADJUSTMENT

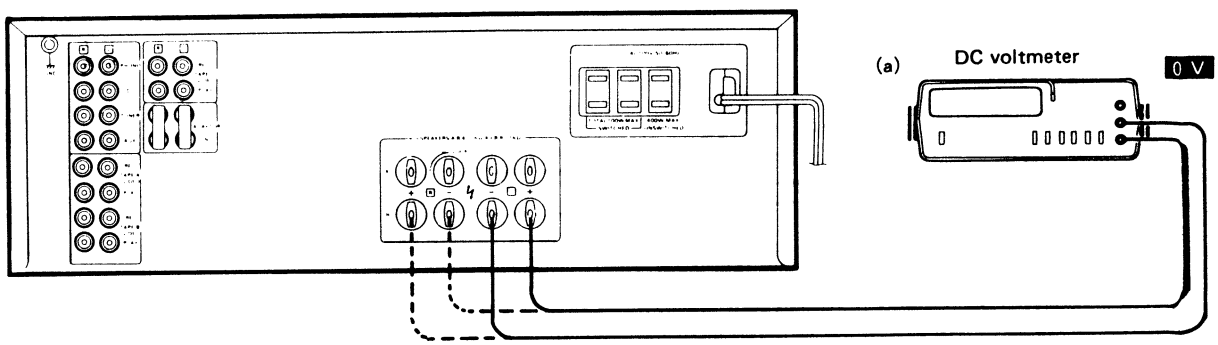
No.	ITEM	INPUT SETTINGS	OUTPUT SETTINGS	AMPLIFIER SETTINGS	ALIGNMENT POINTS	ALIGN FOR	FIG.
1	OFFSET	–	Connect a DC voltmeter to SPEAKER B terminal.	VOLUME: 0	VR1 (L) VR2 (R)	0V	(a)
2	IDLE CURRENT	–	Connect a DC voltmeter across R71 (L) R72 (R)	VOLUME: 0	VR3 (L) VR4 (R)	13mV	(b)

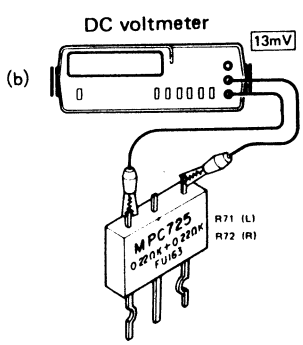
REGLAGE

N°	ITEM	REGLAGE DE L'ENTREE	REGLAGE DE LA SORTIE	REGLAGE DE L'AMPLIFICATEUR	POINTS DE L'ALIGNMENT	ALIGNER POUR	FIG.
1	OFFSET	–	Connecter un voltmètre de CC aux bornes de sortie + et – (SPEAKER B)	VOLUME: 0	VR1 (G) VR2 (D)	0V	(a)
2	COURANT DE POLARISATION	–	Connecter un voltmètre de CC sur R71 (G) R72 (D)	VOLUME: 0	VR3 (G) VR4 (D)	13mV	(b)

ABGLEICH

NR.	GEGENSTAND	EINGANGS-EINSTELLUNG	AUSGANG-EINSTELLUNG	VORSTÄRKER-EINSTELLUNG	ABGLEICHE-PUNKTE	ABGLEICHEEN FÜR	ABB.
1	OFFSET	–	Einen Gleichspannungs-messer zu SPEAKER B anschließen.	VOLUME: 0	VR1 (L) VR2 (R)	0V	(a)
2	LEERLAUF-STROM	–	Einen Gleichspannungs-messer über R71 (L) R72 (R) anschließen.	VOLUME: 0	VR3 (L) VR4 (R)	13mV	(b)





(X11-1852-72) (D/6)

S4 R44 100K R43 100K R42 47K R41 47K J8 J102

J133 (X08-2170-11)(A/10)

PHONO Lch Rch
CD Lch Rch
TUNER Lch Rch
TAPE A REC Lch Rch PLAY Lch Rch
TAPE B REC Lch Rch PLAY Lch Rch
AUX FRONT Lch Rch
TAPE C REC Lch Rch PLAY Lch Rch
AUX Lch Rch
IN ADAPTOR Lch Rch OUT Lch Rch

D20 D19 C49 330P J101 REC OUT S1

(X08-2170-11) (E/10) J115 S5

(X08-2170-11) (D/10) J114

(X08-2170-11)(G/10) J116 D11 D12 D13 C B A

(X08-2170-11)(F/10) J117 D6 D7 D8 D9 D10

(X08-2170-11) (C/10) CN4 CN3

J109 J110 J111 J112 J113 CN4 J106 J105 J107 J101

S3-a S3-b S3-c TAPE SEL. S2-a S2-b S2-c S2-d S2-e INPUT SEL. S6 CD

J119 J118 J116 J117 J120 D1 CD

J129 J128 J104 J103 J106 J105 J107

AVR Q5 Q9 Q15 D17 D4 D15 D16 D3 D18 Q6 Q10 -12V -44V 20V

EQ AMP IC1 (1/2) IC1 (2/2) Q1 Q3 Q2 Q4 Q13 D1 D2 D21 14V 19.4V -19.4V

MAIN AMP (X07-2000-11)(A/2)

Q13 D6 D7 Q15 Q11 Q1 Q3 Q5 OFFSET VR1 100(B) D24 Q9 D1 D4 D2 D5 Q10 Q18 Q20 Q12 Q16 D8 Q7 D3 VR2 100(B) OFFSET Q6 Q2 Q4

IC1 (A/2) IDLE VR3 50K(B) DRIVER

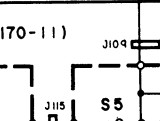
IC3 DLD

IC2 (A/2) IDLE VR4 50K(B)

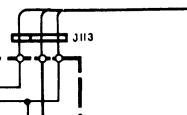
IC4

2SA1124
2SA988
2SA999
2SC1845
2SC2320
2SC2631
2SC2632
2SC945(A)

2SA1110
2SC2590

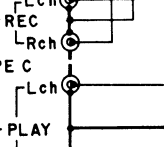


2SB724

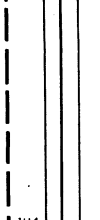


2SA1349

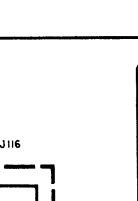
2SK136
2SK163
2SK170



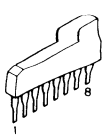
UPA68H



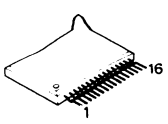
NE5532P
NJM2041D-D
NJM5532D



UPC1237H



TA2030



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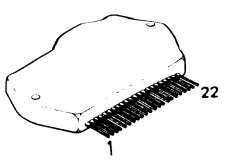
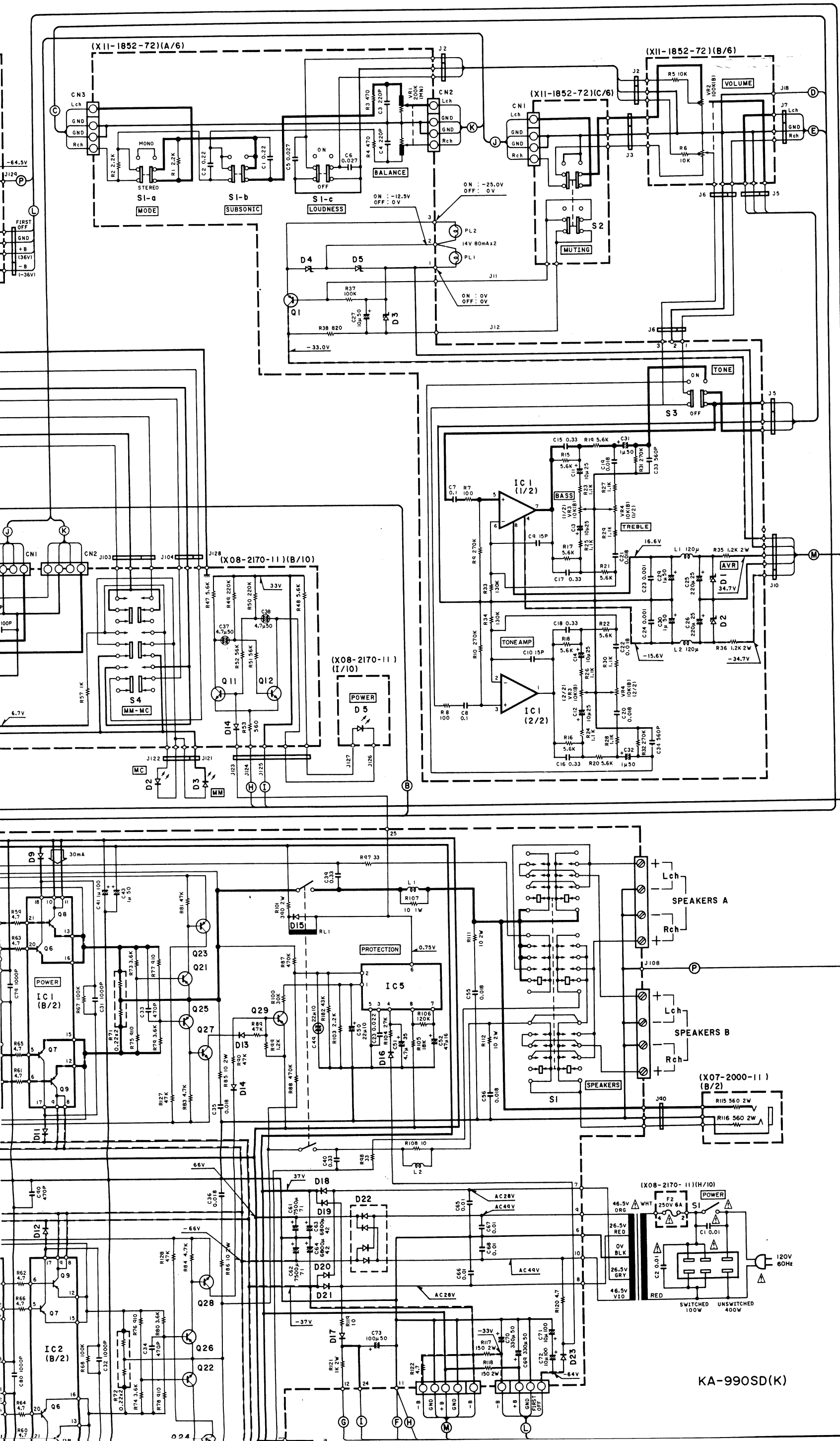




(X08-2170-00)

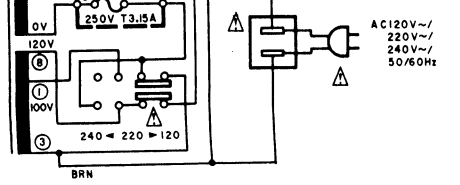
IC1	: NE55332P or NJM5532D
Q1~4	: 2SK170(BL,V)
Q5	: 2SC2590(Q,R)
Q6	: 2SA1110(Q,R)
Q9,10	: 2SK163(M,N) or 2SK136(S)
Q11~13	: 2SC945(A)(Q,P) or 2SC2320(E,F)
D1	: RD5.1J(B2)
D2,15,16,19,20	: 1S2076 or 1S1555
D3,4	: RD20J(B2)
D5	: B30-0483-05
D6~10	: B30-1012-05
D11~13	: B30-1010-05
D14	: 1S2076A
D17,18	: E-272
D21	: RD12J(B2)

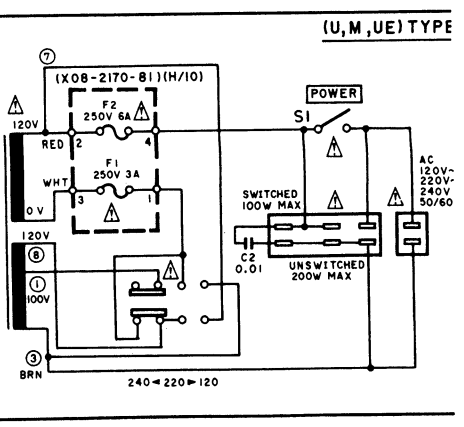
(X11-1850-00)

IC1	: NJM2041D-D
Q1	: 2SB724(P,O)
D1,2	: RD16E(B3)
D3	: RD27E(B2)
D4,5	: RD13E(B3)

(X07-2000-02)

IC1,2	: TA2040
IC3,4	: TA2030
IC5	: μPC1237H
Q1~4,9,10	: 2SC1845
Q5,6	: μPA68H(K,L)
Q7,17~20	: 2SC2632(Q,R,S)
Q11,12	: 2SA1349
Q13,15,16	: 2SA1124(Q,R,S)
Q21,22	: 2SC2320
Q23~26	: 2SA999
Q27,28	: 2SC2631(Q,R,S)
Q29	: 2SA988
D1,5	: RD22J(B2)
D2,7,8	: 1S2076
D3	: RD10E(B3)
D4	: RD5.6J(B1)
D6	: RD16E(B3)
D9~12	: RU4Z
D13~16	: 1S2076A
D17	: DSM1A1
D18~21	: S3V20
D22	: M4C-52-12*1 or M4C-51-12*1
D23	: V06C
D24	: E-102





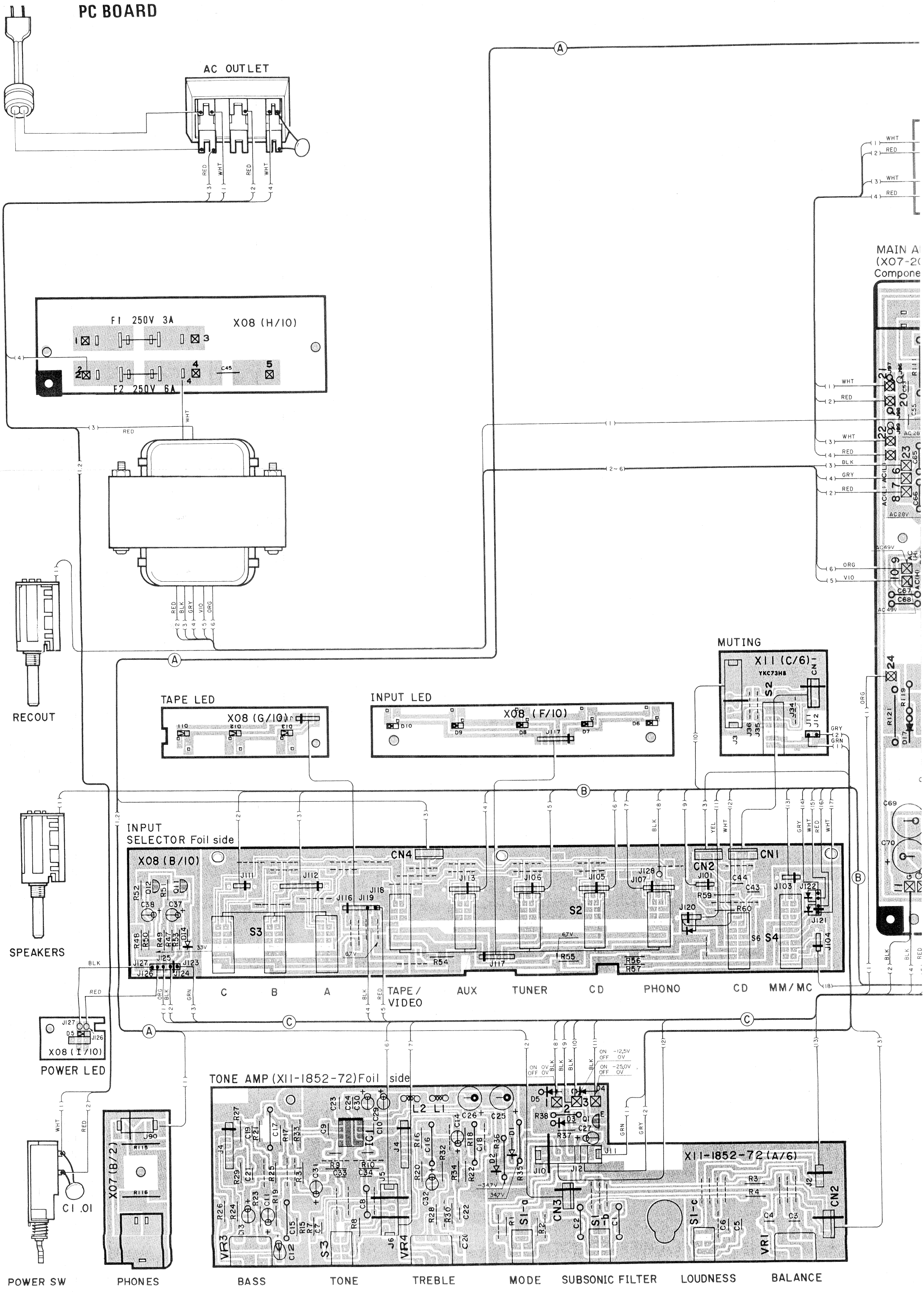
- DC voltages are as measured with a high impedance voltmeter with no signal input. Values may vary slightly due to variations between individual instruments or/and units.

CAUTION: For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list). ⚠Indicates safety critical components. To reduce the risk of electric shock, leakage-current or resistance measurements shall be carried out (exposed parts are acceptably insulated from the supply circuit) before the appliance is returned to the customer.

KA-990SD

KENWOOD

PC BOARD



Refer to the schematic diagram for the values of resistors and capacitors.

C3
5600μF 42V

C4
5600μF 42V

PHONO MM
IMPEDANCE

X11(D/6)

PRE AMP
(X08-2170-11)
Component side

X08(C/10)

CN3 CN4

AMP
2000-11)
nent side

X07-2000-11
J25-4439-01 A/2

X08-2170-11 (A/10)
J25-4435-01

EQ AMP

REC SEL

TONE

MAIN VOLUME
X11(B/6)
VR2

14V 80mA

PL1 PL2

FRONT

D1 CD
D3 MM
D2 MC

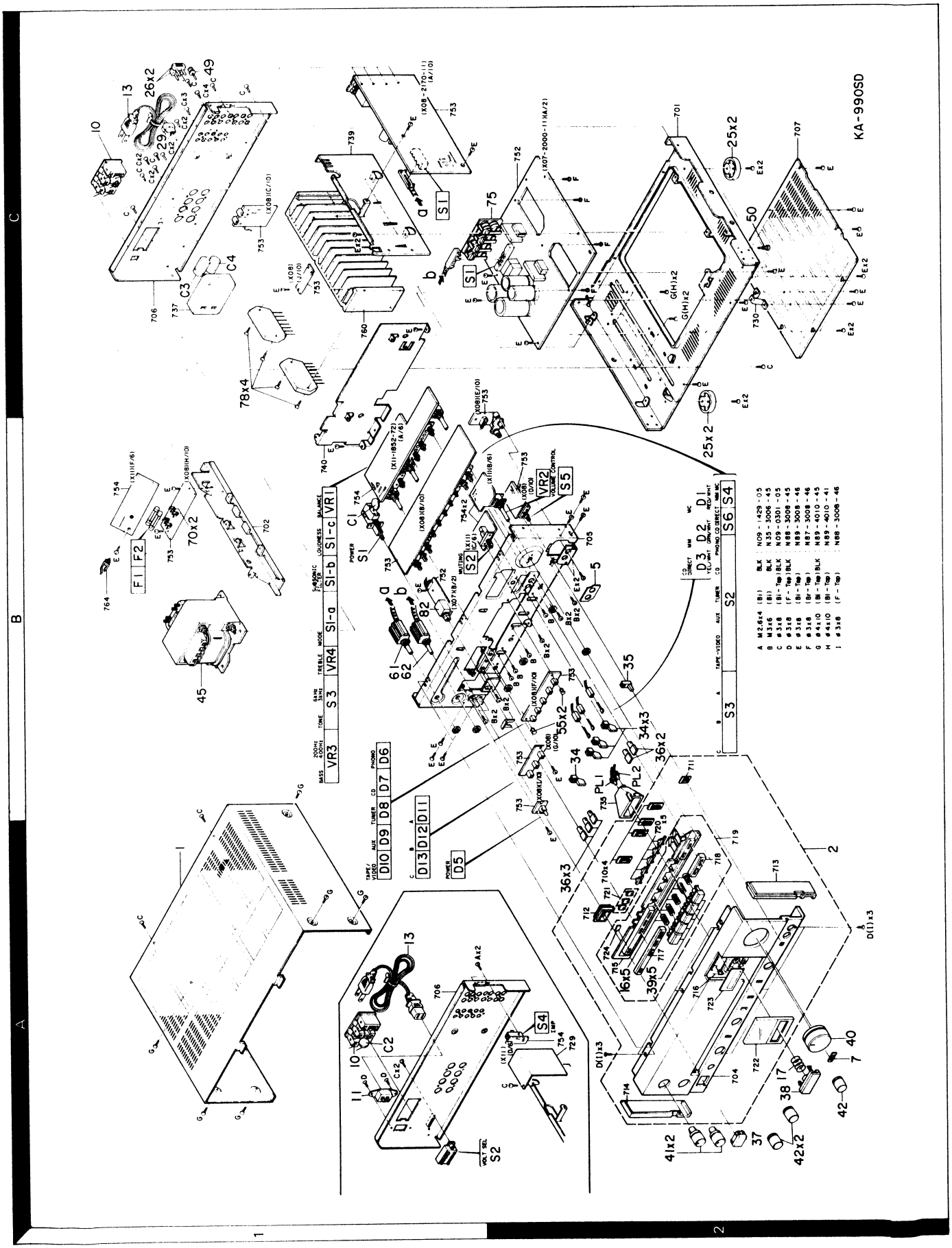
AUX

X08(D/10)
S5

AUX/FRONT
X08(E/10)

KA-990SD(K)

EXPLODED VIEW



Parts with the exploded numbers larger than 700 are not supplied.

PARTS LIST

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KA-990SD						
1	1A	*	A01-1340-02	METALLIC CABINET		
2	2A	*	A20-4024-01	PANEL ASSY		
5	2B		B03-0229-04	DRESSING PLATE(FRONT AUX)		
7	2A		B43-0270-04	BADGE(GOLD) SUPER DLD	K	
-			B46-0092-03	WARRANTY CARD	P	
-			B46-0093-03	WARRANTY CARD	UUE	
-			B46-0094-03	WARRANTY CARD	UUE	
-			B46-0095-03	WARRANTY CARD	X	
-			B46-0096-03	WARRANTY CARD	E	
-			B46-0098-03	WARRANTY CARD		
-		*	B50-5340-00	INSTRUCTION MANUAL(ENGLISH)	PMXE	
-		*	B50-5341-00	INSTRUCTION MANUAL(FRENCH)		
-		*	B50-5342-00	INSTRUCTION MANUAL(SPANISH)	M	
-		*	B50-5343-00	INSTRUCTION MANUAL(G,D,I)	E	
-		*	B50-5354-00	INSTRUCTION MANUAL(ARABIC)	M	
-			B58-0222-14	CAUTION CARD(PRESET 220V)	UE	
-			B58-0223-04	CAUTION CARD(PRESET 120V)	U	
-			B58-0245-23	CAUTION CARD(FTZ)	E	
-			B58-0269-04	CAUTION CARD	K	
-			B59-0092-00	SERVICE DIRECTORY	UUE	
D1	2B		B30-0469-05	LED(SLP-162B)RED/WHT(MC)		
D2	2B		B30-0469-05	LED(SLP-162B)GRN/WHT(MM)		
D3	2B		B30-0470-05	LED(SLP-262B)YEL/WHT(CD)		
PL1 ,2	2B		B30-0445-15	LAMP(14V 0.08A)MUTING IND		
C1	1B		C91-0647-05	CERAMIC 0.01UF P	KPXE	
C2	1A		C91-0023-05	CERAMIC 0.01UF AC250V	UMUE	
C3 ,4	1C		C90-1299-05	ELECTRO 5600UF 42WV		
10	1C		E03-0069-05	AC OUTLET	KPUM	
10	1C		E03-0069-05	AC OUTLET	UE	
11	1A		E03-0058-05	AC INLET	UMUEX	
11	1A		E03-0058-05	AC INLET	E	
13	1C		E30-0181-05	AC POWER CORD	K	
13	1A		E30-0726-05	AC POWER CORD (INLET)	E	
13	1A		E30-0729-05	AC POWER CORD (INLET)	X	
13	1A		E30-0780-05	AC POWER CORD	P	
13	1A		E30-0852-05	AC POWER CORD (INLET)	UMUE	
16	2A		G01-0488-04	COMPRESSION SPRING(SEL KNOB)		
17	2A		G01-0489-04	COMPRESSION SPRING(MUT KNOB)		
-		*	H01-5231-04	ITEM CARTON CASE		
-			H10-1631-12	POLYSTYRENE FOAMED FIXTURE		
-			H10-1632-02	POLYSTYRENE FOAMED FIXTURE		
-			H20-0225-04	PROTECTION COVER		
-			H25-0078-04	PROTECTION BAG(235X315)		
-			H25-0204-04	PROTECTION BAG(100X315X0.05)		
25	2B,2C		J02-0126-05	FOOT 40X16		
26	1C		J12-0094-05	PIN SHORT PIN		
29	1C		J42-0083-05	POWER CORD BUSHING	KP	
-			J61-0307-05	WIRE BAND		
34	2B		K27-0915-04	KNOB(BUTTON)TONE,MODE,FIL,LOUD		
35	2B		K27-0916-04	KNOB(BUTTON)AUX		

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36	2A,2B		K27-0965-04	KNOB(BUTTON)A,B,C,CD,MM/MC		
37	2A		K27-1141-04	KNOB(BUTTON)POWER		
38	2A		K27-1248-13	KNOB(BUTTON)MUTING		
39	2A		K27-1278-03	KNOB(BUTTON)SELECTOR		
40	2A		K29-1821-04	KNOB VOLUME CONTROL		
41	2A		K29-1822-04	KNOB REC OUT,SPEAKERS		
42	2A		K29-1823-04	KNOB BASS,TREBLE,BALANCE		
45	1B	*	L01-2471-15	POWER TRANSFORMER	K	
45	1B	*	L01-2477-15	POWER TRANSFORMER	P	
45	1B	*	L01-3196-15	POWER TRANSFORMER	UMUEX	
45	1B	*	L01-3196-15	POWER TRANSFORMER	E	
49	1C		N08-0128-35	BINDING POST GND		
50	2C		N09-0301-05	TAPTITE SCREW 3X8,+		
55	2B		N29-0216-05	RIVET		
61	1B		S90-0060-05	REMOTE SWITCH SHAFT(REC OUT)		
62	1B	*	S90-0079-05	REMOTE SWITCH SHAFT(SPEAKERS)		
S1	1B		S40-1015-05	PUSH SWITCH (POWER)	P	
S1	1B		S40-1073-05	PUSH SWITCH (POWER)	KUMUE	
S1	1B		S40-1073-05	PUSH SWITCH (POWER)	XE	
S2	2A		S31-2082-05	SLIDE SWITCH(VOLT SEL)	UMUEX	
S2	2A		S31-2082-05	SLIDE SWITCH(VOLT SEL)	E	
POWER AMPLIFIER (X07-2000-11)						
C1 ,2			CC45FSL1H101J	CERAMIC 100PF J		
C3 ,4			CK45FB1H102K	CERAMIC 0.001UF K		
C5 ,6			CC45FSL1H470J	CERAMIC 47PF J	XE	
C7 -12			CE04FW2A010MEL	ELECTRO 1.0UF 100WV		
C13 ,14			CC45FSL1H101J	CERAMIC 100PF J		
C15 ,16			CE04FW1A220MEL	ELECTRO 22UF 10WV		
C17 ,18			CC45SL1H121J	CERAMIC 120PF J		
C19 ,20		*	CC45SL2H270J	CERAMIC 27PF J		
C21 ,22			CE04W2AR22MEL	ELECTRO 0.22UF 100WV		
C23			CF92FV1H223J	MF 0.022UF J		
C24 ,25			CE04FW2A101MEL	ELECTRO 100UF 100WV		
C26			CE04FW1A470MEL	ELECTRO 47UF 10WV		
C27 ,28		*	CC45FSL1H180J	CERAMIC 18PF J		
C29 ,30			CQ93FM1H393K	MYLAR 0.039UF K	XE	
C31 ,32		*	CK45B2H102K	CERAMIC 1000PF K		
C33 ,34			CC45FSL1H471J	CERAMIC 470PF J		
C35 ,36			CF92FV1H183J	MF 0.018UF J	KPUM	
C35 ,36			CF92FV1H183J	MF 0.018UF J	UE	
C35 ,36			CQ93FM1H393K	MYLAR 0.039UF K	XE	
C37 ,38		*	CE04HW1C4R7MEL	NP-ELEC 4.7UF 16WV		
C39 ,40			CQ93M1H334K	MYLAR 0.33UF K		
C41 ,42			CE04FW2A010MEL	ELECTRO 1.0UF 100WV		
C43 ,44			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
C45 ,46			CE04FW2A010MEL	ELECTRO 1.0UF 100WV		
C47 ,48			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
C49			CE04HW1A220MEL	NP-ELEC 22UF 10WV		
C50			CE04FW1A220MEL	ELECTRO 22UF 10WV		
C51			CE04FW1V4R7MEL	ELECTRO 4.7UF 35WV		
C52			CE04GW1C470MEL	LL-ELEC 47UF 16WV		
C53 -56			CF92FV1H393J	MF 0.039UF J	XE	
C55 ,56			CF92FV1H183J	MF 0.018UF J	KPUM	

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C55 ,56			CF92FV1H183J	MF	0.018UF	J		UE	
C61 ,62			C90-0567-05	ELECTRO	7500UF	71WV			
C63 ,64		*	C90-1306-05	ELECTRO	5600UF	56WV			
C65 -68			CK45E2H103P	CERAMIC	0.01UF	P			
C69 ,70			CE04W1H331MEL	ELECTRO	330UF	50WV			
C71 ,72		*	CE04FW2A100MEL	ELECTRO	10UF	100WV			
C73			CE04W1H101MEL	ELECTRO	100UF	50WV			
C75 -78		*	CK45FB1H472K	CERAMIC	4700PF	K		XE	
C79 ,80		*	CK45B2H102K	CERAMIC	1000PF	K			
C81 -84			CC45SL1H121J	CERAMIC	120PF	J			
C85 ,86			CK45FB1H102K	CERAMIC	0.001UF	K			
C90			CK45B1H222K	CERAMIC	0.0022UF	K			
75	2C		E20-0821-05	LOCK TERMINAL BOARD(8P)SPEAKER					
82	1B		E11-0103-05	PHONE JACK	3P				
-			J61-0045-15	WIRE BAND					
L1 ,2			L39-0085-05	PHASE-COMPENSATION COIL					
L3 ,4			L33-0275-05	CHOKE COIL					
78	1C	*	N09-1236-05	TAPPING SCREW 3X16,+					
R20		*	RD14GB2E753JTS	FL-PROOF RD	75K	J	1/4W		
R23		*	RS14DB3A821JTE	FL-PROOF RS	820	J	1W		
R24		*	RD14GB2E102JTS	FL-PROOF RD	1.0K	J	1/4W		
R29 ,30		*	RS14KB3A822JTE	FL-PROOF RS	8.2K	J	1W		
R47 ,48		*	RD14AB2E751JTS	FL-PROOF RD	750	J	1/4W		
R49 ,50		*	RD14GB2E751JTS	FL-PROOF RD	750	J	1/4W		
R51			RD14GB2E181JTS	FL-PROOF RD	180	J	1/4W		
R52		*	RD14AB2E181JTS	FL-PROOF RD	180	J	1/4W		
R57			RD14GB2E220JTS	FL-PROOF RD	22	J	1/4W		
R58			RD14AB2E220JTS	FL-PROOF RD	22	J	1/4W		
R59 ,60			RD14GB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R61 ,62			RD14AB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R63 ,64			RD14GB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R65 ,66			RD14AB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R69 ,70			RD14GB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R71 ,72			R90-0187-05	MULTI-COMP	0.22X2	K	5W		
R75 -78			RD14GB2E911JTS	FL-PROOF RD	910	J	1/4W		
R85		*	RS14DB3D100JTE	FL-PROOF RS	10	J	2W		
R86		*	RS14KB3D100JTE	FL-PROOF RS	10	J	2W		
R91 ,92		*	RN14BK2C3902FTS	RN	39.0K	F	1/6W		
R97 ,98			RD14GB2E330JTS	FL-PROOF RD	33	J	1/4W		
R101		*	RS14KB3D391JTE	FL-PROOF RS	390	J	2W		
R107,108		*	RS14DB3A100JTE	FL-PROOF RS	10	J	1W		
R111,112		*	RS14DB3D100JTE	FL-PROOF RS	10	J	2W		
R115,116		*	RS14DB3D561JTE	FL-PROOF RS	560	J	2W		
R117,118		*	RS14DB3D151JTE	FL-PROOF RS	150	J	2W		
R119			RD14GB2E100JTS	FL-PROOF RD	10	J	1/4W		
R120			R92-0514-05	FUSE RESIST	4.7		1/4W		
R121		*	RS14DB3D102JTE	FL-PROOF RS	1.0K	J	2W		
R122			RD14AB2E4R7JTS	FL-PROOF RD	4.7	J	1/4W		
R123-126			RD14GB2E331JTS	FL-PROOF RD	330	J	1/4W		
VR1 ,2			R12-0502-05	TRIMMING POT(100)OFFSET					
VR3 ,4			R12-4306-05	TRIMMING POT(50K)IDLE					

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RL1			S51-2045-05	MAGNETIC RELAY					
S1	1C	*	S90-0062-05	SLIDE SWITCH(SPEAKERS)					
D1			RD22J(B2)	ZENER DIODE					
D2			1S2076	DIODE					
D3			RD10E(B3)	ZENER DIODE					
D4			RD5.6J(B1)	ZENER DIODE					
D5			RD22J(B2)	ZENER DIODE					
D6			RD16E(B3)	ZENER DIODE					
D7 ,8			1S2076	DIODE					
D9 -12			RU4Z	DIODE					
D13 -16			1S2076A	DIODE					
D17			DSM1A1	DIODE					
D18 -21			S3V20	DIODE					
D22			M4C-51-12*1	DIODE					
D22			M4C-52-12*1	DIODE					
D23			V06C	DIODE					
D24		*	E-102	CONSTANT CURRENT DIODE					
IC1 ,2		*	TA2040	IC(POWER)					
IC3 ,4		*	TA2030	IC(SWITCHING)					
IC5			UPC1237H	IC(PROTECTION)					
Q1 -4			2SC1845	TRANSISTOR					
Q5 ,6			UPA68H(K,L)	DUAL FET					
Q7			2SC2632(Q,R,S)	TRANSISTOR					
Q9 ,10			2SC1845	TRANSISTOR					
Q11 ,12			2SA1349	DUAL TRANSISTOR					
Q13			2SA1124(Q,R,S)	TRANSISTOR					
Q15 ,16			2SA1124(Q,R,S)	TRANSISTOR					
Q17 -20			2SC2632(Q,R,S)	TRANSISTOR					
Q21 ,22			2SC2320	TRANSISTOR					
Q23 -26			2SA999	TRANSISTOR					
Q27 ,28			2SC2631(Q,R,S)	TRANSISTOR					
Q29			2SA988	TRANSISTOR					
PREAMPLIFIER (X08-2170-11)									
D5	1A		B30-0483-05	LED(SLP-170B) POWER					
D6 -10	1A,1B		B30-1012-05	LED(SLP-981C-5D) SELECTOR					
D11 -13	1A,1B		B30-1010-05	LED(SLP-281F-50U)TAPE A,B,C					
C1 ,2		*	CQ09FS1H121JZS	POLYSTY	120PF	J		KPUM	
C1 ,2		*	CQ09FS1H121JZS	POLYSTY	120PF	J		UE	
C3 ,4			CK45FB1H561K	CERAMIC	560PF	K		XE	
C3 ,4			CQ09FS1H561JZS	POLYSTY	560PF	J		KPUM	
C3 ,4			CQ09FS1H561JZS	POLYSTY	560PF	J		UE	
C5 ,6			CC45FSL1H121J	CERAMIC	120PF	J		XE	
C7 ,8			CK45FB1H222K	CERAMIC	2200PF	K		XE	
C9 ,10		*	CQ09FS1H102JZS	POLYSTY	1000PF	J			
C11 -26			CC45FSL1H101J	CERAMIC	100PF	J		XE	
C27 ,28			CE04FW0J222MEL	ELECTRO	2200UF	6.3WV			
C29 ,30		*	CE04HW1E4R7MEL	NP-ELEC	4.7UF	25WV			
C31 ,32			CE04FW1E470MEL	ELECTRO	47UF	25WV			
C33 ,34			CF92FV1H103J	MF	0.010UF	J			
C35 ,36			CE04FW1H2R2MEL	ELECTRO	2.2UF	50WV			
C37 ,38			CE04HW1E4R7MEL	NP-ELEC	4.7UF	25WV			
C39 ,40		*	CQ93HP2A163GMA	MYLAR	0.016UF	G			
C41 ,42		*	CQ93HP2A563GMA	MYLAR	0.056UF	G			
C43 ,44		*	CQ09FS1H101JZS	POLYSTY	100PF	J			

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⚠	C45			C91-0647-05	CERAMIC 0.01UF P	XE	
	C47 ,48			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
	C49			CC45FSL1H331J	CERAMIC 330PF J		
	C50			CE04FW1H010MEL	ELECTRO 1.0UF 50WV		
	-			E13-0223-05	PHONO JACK(2P)ADAPTOR IN		
	-			E13-0225-05	PHONO JACK(2P)FRONT AUX		
	-			E13-0621-05	PHONO JACK(6P)PHONO,CD,TUNER		
	-			E13-0814-05	PHONO JACK(8P)TAPE A,TAPE B		
	-			E13-0818-05	PHONO JACK(8P)AUX,TAPE C,A OUT		
⚠	F1	1B		F05-3022-05	FUSE 3A 250V	UMUE	
⚠	F1	1B		F05-3121-05	FUSE (SEMKO) T3.15A 250V	XE	
⚠	F2	1B		F05-6021-05	FUSE 6A 250V	UMUE	
⚠	F2	1B		F05-6027-05	FUSE (UL) 6A 250V	KP	
⚠	F2	1B		F05-6321-05	FUSE (SEMKO) T6.3A 250V	XE	
	70	1B		J13-0041-05	FUSE CLIP	KPUM	
	70	1B		J13-0041-05	FUSE CLIP	UE	
	70	1B		J13-0054-05	FUSE CLIP	XE	
	-			J61-0307-05	WIRE BAND		
	L1 ,2			L33-0275-05	CHOKE COIL		
	L3 ,4			L40-1011-43	SMALL FIXED INDUCTOR	XE	
	R7 ,8		*	RN14BK2E8R20GTS	RN 8.20 G 1/4W		
	R9 ,10		*	RN14BK2E107OFTS	RN 107.0 F 1/4W		
	R21 ,22		*	RN14BK2E4751FTS	RN 4.75K F 1/4W		
	R23 ,24		*	RN14BK2E5762FTS	RN 57.6K F 1/4W		
	R59 ,60			RN14BK2C3300FTS	RN 330.0 F 1/6W		
	S1	1C		S90-0078-05	SLIDE SWITCH REC OUT		
	S2	2B		S42-5033-05	MULTIPLE PUSH SW(5KEY)SELECTOR		
	S3	2B		S42-3086-05	MULTIPLE PUSH SW(3KEY)A,B,C		
	S4	2B	*	S40-6027-05	PUSH SWITCH (2KEY)MM/MC		
	S5	2B		S40-2122-05	PUSH SWITCH AUX		
	S6	2B	*	S40-4060-05	PUSH SWITCH CD DIRECT		
	D1			RD5.1J(B2)	ZENER DIODE		
	D2			1S1555	DIODE		
	D2			1S2076	DIODE		
	D3 ,4			RD20J(B2)	ZENER DIODE		
	D14			1S2076A	DIODE		
	D15 ,16			1S1555	DIODE		
	D15 ,16			1S2076	DIODE		
	D17 ,18			E-272	CONSTANT CURRENT DIODE		
	D19 ,20			1S1555	DIODE		
	D19 ,20			1S2076	DIODE		
	D21			RD12J(B2)	ZENER DIODE		
	IC1			NE5532P	IC(OP AMP)		
	IC1			NJM5532D	IC(OP AMP)		
	Q1 -4			2SK170(BL,V)	FET		
	Q5			2SC2590(Q,R)	TRANSISTOR		
	Q6			2SA1110(Q,R)	TRANSISTOR		
	Q9 ,10			2SK136(S)	FET		
	Q9 ,10			2SK163(M,N)	FET		
	Q11 -13			2SC2320(E,F)	TRANSISTOR		
	Q11 -13			2SC945(A)(Q,P)	TRANSISTOR		
	CONTROL (X11-1852-72)						
	C1 ,2			CQ93M1H224J	MYLAR 0.22UF J		

E: Scandinavia & Europe H: Audio Club K: USA P: Canada
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⚠ indicates safety critical components.

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PARTS LIST

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C3 ,4			CC45FSL1H221J	CERAMIC 220PF J		
C5 ,6			CQ93FM1H273K	MYLAR 0.027UF K		
C7		*	CQ93FM1H104J	MYLAR 0.10UF J		
C8			CQ93M1H104J	MYLAR 0.1UF J		
C9 ,10			CC45FSL1H150J	CERAMIC 15PF J		
C11 -14			CE04FW1E100M	ELECTRO 10UF 25WV		
C15 -18			CQ93M1H334J	MYLAR 0.33UF J		
C19 -22			CQ93FM1H183J	MYLAR 0.018UF J		
C23 ,24			CQ93FM1H102K	MYLAR 1000PF K		
C25 ,26		*	CE04FW1E221M	ELECTRO 220UF 25WV		
C27			CE04FW1H100M	ELECTRO 10UF 50WV		
C29 ,30			CE04FW1H010M	ELECTRO 1UF 50WV		
C31			CE04W1H010M	ELECTRO 1UF 50WV		
C32			CE04FW1H010M	ELECTRO 1UF 50WV		
C33 ,34			CK45FB1H561K	CERAMIC 560PF K		
-			J61-0045-15	WIRE BAND		
R35 ,36			RS14KB3D122JTE	FL-PROOF RS 1.2K J 2W		
R38		*	RD14GB2E821JTS	FL-PROOF RD 820 J 1/4W		
VR1	1B	*	R06-5098-05	POTENTIOMETER(200KX2)BALANCE		
VR2	1B	*	R06-5133-05	POTENTIOMETER VOLUME		
VR3 ,4	1B	*	R06-3032-05	POTENTIOMETER(10KX2) BASS,TREB		
S1	1B	*	S42-3063-05	MULTIPLE PUSH SW(MODE,SUB,LOUD		
S2	2B	*	S40-4045-05	PUSH SWITCH (MUTING)		
S3	1B		S40-2122-05	PUSH SWITCH (TONE)		
S4	2A		S31-2059-05	SLIDE SWITCH (IMP)		
D1 ,2			RD16E(B2)	ZENER DIODE		
D3			RD27E(B2)	ZENER DIODE		
D4 ,5			RD13E(B3)	ZENER DIODE		
IC1			NJM2041D-D	IC(OP AMP)		
Q1			2SB724(P,Q)	TRANSISTOR		

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KA-990SD

SPECIFICATIONS

Power Amplifier Section

Power Output

150 watts* per channel minimum RMS, both channels driven at 8 ohms from 20 Hz to 20,000 Hz with no more than 0.004% total harmonic distortion

Both Channels Driven into 8 ohms at 1 kHz	160 W + 160 W (Except USA and Canada)
Dynamic Power Output into 4 ohms	368 W (Except USA and Canada)
Total Harmonic Distortion (20 Hz to 20,000 Hz) AUX input to SPEAKER output	0.004% at rated power into 8 ohms 0.003% at 1/2 rated power into 8 ohms
Intermodulation Distortion (60 Hz:7 kHz = 4:1)	0.003% at rated power into 8 ohms
Damping Factor	1,000, at 50 Hz
Transient Response	
Rise Time	1.7 μs
Slew Rate	±100 V/μs
Frequency Response	DC to 200 kHz, +0 dB, −3 dB
Speaker Impedance	Accept 4 ohms to 16 ohms
Input Sensitivity/Impedance	
Phono MM	2.5 mV/47 k ohms
Phono MC	0.1 mV/100 ohms
Tuner, CD/AUX., Tape, ADAPTOR IN	150 mV/47 k ohms
Signal-to-Noise Ratio (IEC-A)	
Phono MM	88 dB for 2.5 mV input
Phono MC	70 dB for 100 μV input
Tuner, CD/AUX, Tape	108 dB

Note :

We follow a policy of continuous advancements in development. For this reason specifications may be changed without notice.

Maximum Input Level for Phono	
MM	200 mV (RMS), T.H.D. 0.003% at 1 kHz
MC	8 mV (RMS), T.H.D. 0.003% at 1 kHz
Output Level/Impedance	
Tape REC (Pin), ADAPTOR OUT	150 mV/680 ohms
Frequency Response for Phono	RIAA standard curve ±0.2 dB (20 Hz to 20,000 Hz)
Tone Control	
Bass	±10 dB at 50 Hz, 100 Hz
Treble	±10 dB at 10 kHz, 20 kHz
Loudness Control (at −30 dB VOLUME Level)	+3/6/9 dB at 30/60/90 Hz
Subsonic Filter	18 Hz, 6 dB/oct.

General

Power Consumption	4 A (USA and Canada) 550 W (U.K., European, Australian countries) 1500 W (Others)
AC Outlets	Switched 2, Unswitched 1 (Except U.K., European, Australian countries)
Dimensions	W: 440 mm (17-5/16") H: 158 mm (6-7/32") D: 383 mm (15-3/32")
Weight (Net)	14.7 kg (32.3 lb)

* Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier in U.S.A.

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